CHAPTER 1

INTRODUCTION
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Vision assessment in children is a major aspect towards preventive health. Preschool screening is advocated over school vision screening as it is the critical frame to intervention.\textsuperscript{1} Timely childhood screening is widely endorsed for avoidable and correctable vision deficits.\textsuperscript{2} Amblyopia, squint and refractive errors are the commonly encountered ocular disorders in childhood.\textsuperscript{3, 4}

Preschool Vision Screening and its relevance

Preschool vision screening (PVS) has been recommended as a cost effective method to differentiate children with vision impairments.\textsuperscript{4, 5} The primary aim of vision screening children at preschool is to reduce the prevalence of amblyopia by referring them while the condition is still amenable to treatment. If the visual deficit is not corrected during the period of visual development, it is likely to be permanent and cannot be rectified later.\textsuperscript{3} It is estimated that 5\% to 6\% of all preschool children have some form of vision defect that might require treatment or follow up, emphasizing the need for preschool vision screening and comprehensive eye care.\textsuperscript{6, 7} PVS had been suggested by the American Academy of Ophthalmology (AAO), American Academy of Paediatrics (AAP), American Association of Pediatric Ophthalmology and Strabismus (AAPOS), American Optometric Association (AOA), American Association of Certified Orthoptists and United States Preventive Services Task Force (USPSTF).\textsuperscript{8, 9, 10, 11, 12, 13}

Significant refractive correction might impact child development, enhancement of school readiness and educational accomplishment.\textsuperscript{9, 14, 15} Distance visual acuity is the sole test in most of the vision screenings. As a result, refractive errors could be unnoticed.\textsuperscript{16, 17}
The definition of normal vision varies with age and the diagnostic tests used. It is hence difficult to state the accurate prevalence of vision impairment in preschoolers. Preschool vision screening programmes were developed based on the experimental data in animals which advocated that early treatment of visual disorders was more effective than treatment later in life. Amblyopia and its risk factors are considered to be the main causes of vision impairment in preschool age group. As children with amblyopia are asymptomatic, they are seldom brought for consultation lest associated with other ocular problems. Vision screening in children are primarily aimed at detecting non strabismic amblyopia. Non strabismic amblyopia occurs frequently due to refractive errors or media opacities. Distorted visual acuity as a result of refractive errors, strabismus or media opacities could become a substantial burden on the affected child. To be left with one eye that has a visual acuity of 20/40 or less might result in reduced stereo acuity, failure to procure a driving license upsetting his or her job choices in future. Parents usually express regret that if only the problem was detected earlier, appropriate intervention could have been initiated. Such sentiments can have impact on the family life for years to come. The components of vision screening in children usually include testing for visual acuity, stereo acuity, refractive status and squint. Any child found to have reduced vision or stereopsis has to be referred for comprehensive eye examination aimed at accurate diagnosis and treatment. 20/20 vision is considered as normal vision in adults. In preschoolers, visual acuity will be worse than 20/20 even in the absence of refractive errors or other ocular anomalies as the visual system is immature. Hence the American Academy of Pediatric Ophthalmology and strabismus recommended referral to eye care providers if visual acuity is worse than 20/40 in this age group. The use of any test to detect amblyopia, strabismus or refractive error must be age appropriate. Age related changes in vision and refractive errors are known to exist in normal and screened
population. This could be attributed to the concentration, co-operation and complexity of the screening tests used. \(^{18}\) Visual acuity and stereopsis develop during the first years of life and so, must be assessed. If the ocular anomalies are not rectified, it would weaken the learning abilities and educational potential of children entering the school. It could impede the growth of the visual pathways in the brain if treatment is not completed before 8 years of age.\(^{21}\)

Children’s learning abilities in school depends on the competency to gather visual input accurately. The nuances of information technology assimilated into education has increased the demand on visual system for effective learning and information processing.\(^{11}\)

Adequate and cost effective vision screening methods should be adopted to detect visual impairment before school entry.\(^{21}\) Photo screening is a preferred option for preschool age children who are unable or non-co-operative to traditional screening.\(^{22}\) The use of photo screening depends on the instrument available in that country and hence the sensitivity and specificity vary. Moreover, studies describing photo screeners are mainly conducted in United States of America (USA) and with our differing population demographics, validation is warranted.\(^{18}\) The results from the Vision in Preschoolers Study (VIP) pave way for the development and implementation of more effective preschool vision screening protocols. Children with vision disorders rarely complain as they cannot understand whether the symptoms experienced are abnormal or are inept to converse their symptoms.\(^{4}\)

Vision screening is critical for the welfare of the children and has bearing on eye health, social development and productivity in adulthood.\(^{2,23}\) Moreover, most of the conditions are correctable.\(^{10}\) Treating these disorders appropriately can hinder adverse
health concerns of lasting visual impairment. Hence, there is a dire need to screen them early enough to detect the visual deficit.

**Rationale for the study**

The optimum protocol for PVS remains vague worldwide. Research indicated that early screening and treatment led to enhanced visual outcomes. Accessibility of effective and consistent test batteries are vital for PVS. There is continuing dispute on the screening batteries, ideal age for administration and referral criteria. There are concerns regarding dearth of protocols for PVS. Methodological weaknesses in published literature stated diverging conclusions and highlighted the necessity for better quality studies.

Some professions demand specific visual acuity and stereo acuity requirements. Currently, the vision screening protocols in childhood, the type of personnel performing the tests, the age at which the child is screened and the setting vary from country to country and even within countries. Most of the screening programmes are done in the developed world as a part of government health care system or private schemes. Screening helps to detect the visual disorders, reduces the prevalence of the problem and improves equity of access to care. USPSTF had recommended at least one vision screening in children aged 3 to 5 years.

School screenings are steered in India as a part of National Programme for the Control of Blindness targeting children of 8 to 15 years. The children below this age group are not screened as a part of the national programme, even though they are visually immature and the uncorrected vision deficit in them may become permanent.
It has been gauged that all cumulative ‘blind years’ of childhood blindness is pretty much the same as total ‘blind years’ of age-related cataract. So, childhood vision damage levies a hefty socioeconomic liability on individuals, societies and nations. In addition, it could have a major bearing on neurodevelopment, quality of life and overall growth during childhood. Moreover, it is of paramount public health and clinical significance to plan appropriate eye-care strategies for the deterrence of vision deficits in the early phases of life. Moreover, racial, geographical and environmental dynamics also play a role in the discrepancies of vision problems worldwide. Therefore, country specific estimates of the prevalence of vision impairment among preschoolers (aged 3 to 6 years) is the need of the hour. Ocular disorders were observed to be the most common disability in younger children.

There is paucity of published articles on vision and eye screening of 3 to 6 year olds in India. There is no uniform protocol for the screening of visual impairment in 3 to 6 years age group which warranted the need for developing a screening protocol for detecting visual impairment in our population. Vision screening in this specific age group is important in our country. At 3 years, the child usually gets into the school for the first time and at 6 years education is imparted by writing on a green or black board, which the child should be able to see. This study attempts to fill in this lacuna in published literature in the Indian context which houses one of the largest numbers of children in the world.
Aim of the study:

Development of a protocol for screening visual impairment in children aged 3 to 6 years

Objectives:

➢ To develop a protocol for screening visual impairment in children aged 3 to 6 years

➢ To validate the

- Visual acuity charts (Lea symbol, HOTV and E charts)
- Stereo acuity charts (Frisby, Randot preschool and Titmus stereo fly test)
- Photo refractor (Plusoptix A09)

for screening visual impairment in 3 to 6 years old children